

CONTRACT NO. NASw-648Research to Determine the Existence and Identity
ofViable Microorganisms in the Stratosphere

NASA CW50698

1st Quarterly Status Report

March 18 to June 18, 1963

Summary

During this quarter, all necessary purchases and arrangements for the first two flights under this contract were completed. On May 11th we successfully launched and recovered a sampler payload, which reached an altitude of 90,000 ft. Although there were mechanical malfunctions of the anticontamination locks, which limited the validity of the biological data, a great deal of pertinent information was obtained that will prove extremely valuable for the remaining three flights of this program. The samplers and instrument packs were recovered intact and are being prepared for another flight in several weeks. We feel the mechanical difficulties that interfered with the past flight can be adequately rectified by inexpensive modifications now being incorporated.

Preparations for Flight

The samplers built and used under contract NASr-81 were renovated and prepared for flight. The spinings which had been dented during previous flights were replaced; the spring mechanisms were checked and reinforced; the polyurethane gaskets around the sealing gates were replaced with silicone rubber gaskets; the tubular framework was straightened. New dust covers and shrouds were prepared and new filter pads were purchased. The blowers and flowmeters were recalibrated, and the control and recording instruments were checked.

Two new balloons were fabricated, and a new ethylene-oxide sterilizing shroud was purchased. The balloons were dusted with fluorescent powder (zinc-cadmium-sulfide) during manufacture to allow a positive and recognizable determination of contamination from this source. Techniques were perfected for maintenance of the payload in a sterile environment after assembly and during storage. Radio command instrumentation was purchased and incorporated in the payload to provide a backup system for the automatic sequencing switches.

Stratospheric meteorological analyses were initiated to aid in programming the flights.

The complete payload was assembled and checked in the altitude chamber. During simulated flight, all systems and equipment performed satisfactorily.

OTS PRICE

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XEROX \$ 1.10 ph
MICROFILM \$ -----
CR-50,698

Flight No. 1 (NASA 3)

On May 11th a probe was launched from New Brighton, Minnesota. The samplers rose to 89,000 ft., the dust covers were jettisoned, and the balloon started a slow descent. At 87,000 ft., Samplers 1 and 2 were activated. Sampler 1 (float control) operated for the initial 4 minutes and aspirated about 5,000 cu ft of the highest-level air before terminating. Sampler 2 continued to sample (90,00 cu ft) during descent to 65,000 ft where it terminated. Sampler 3 started at 65,000 ft and aspirated 30,000 cu ft between that altitude and 45,000 ft. Sampler 4 was our sterile control. It was treated the same way as all other units (assemble, autoclave, attach to gondola, store in ethylene-oxide protected only by dust-cover system). Immediately prior to launch, its gates were closed and automatically locked. This unit went through the whole flight sequence in the locked position.

The payload was air borne for 6 hours and impacted without damage in a fallow field near Black River Falls, Wisconsin. Upon examination, there was some doubt about the automatic locking of the anticontamination gates on Samplers 1, 2 and 3. Environmental samples of air, grass, and soil were taken from launch and impact sites for subsequent bacteriological analyses.

Results of Flight No. 1 (NASA 3)

Bacteriological samplings of the exterior surface of the payload immediately prior to launch showed less than 1 colony per 45 cm^2 . After impact, the count on the same exterior surfaces were about 10 per cm^2 . This indicated that the sterilizing and storage techniques prior to launch were very satisfactory.

Analysis for fluorescent particles on the filter indicated no "fallout" from the balloon was entrained during sampling. This was very encouraging and indicated that the concept of sampling during descent had been properly programmed.

The sterile control contained a total of 3 organisms. Since this sampler would contain all of the contamination acquired during storage and launch preparation, as well as the contamination encountered by the other samples during descent below their sampling profiles, impact, transportation, and analysis, we are extremely pleased. We now can be confident that samplers which perform well, and in which the gates lock in the stratosphere, contain valid stratospheric samples. This was the first flight in the series wherein a sterile control ascended and descended locked and suggests that the contamination controls designed for the program will serve their purpose if there are no mechanical malfunctions.

Unfortunately the samplers exposed in the stratosphere (Samplers 1, 2 and 3) were contaminated uniformly with fungi and bacteria found in great abundance on the grass at impact. We rechecked the sealing and locking devices and found that they may have malfunctioned at altitude. Consequently, we assume that the filters may have been contaminated with aerosolized dust at impact. This ground-level contamination was sufficient to mask any stratospheric samples we obtained, and consequently limited the success of the experiment.

Preparations for the Next Flight

Except for correcting the mechanical problems, we are ready for another launch. The balloon is available. The equipment, power supply, instruments, and control systems were recovered from the first flight undamaged and can be made ready in a short time. We are proceeding with the meteorological analyses and will be able to meet the contract requirements in the allotted time period.